

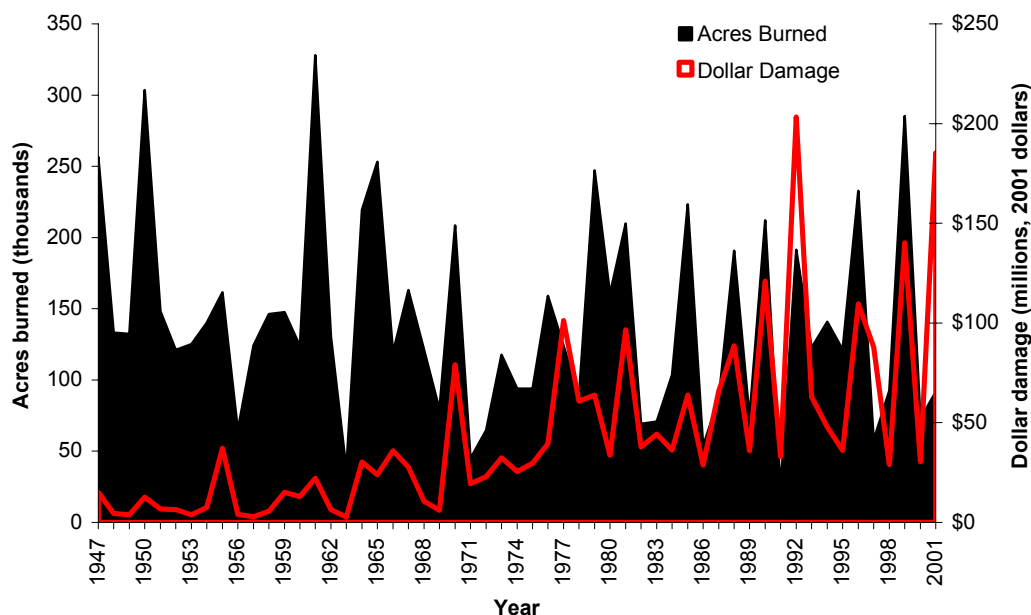
California's Wildland Fire Infrastructure

The challenge of wildfire

Fire is an integral component of many of California's ecosystems. However, uncontrolled wildfires are costly, risking the lives and property of rural residents, and compromising watersheds, open space, timber, range, recreational opportunities, wildlife habitats, endangered species, historic and cultural assets, wild and scenic rivers, other scenic assets, and local economies. The challenge is how to manage across California's diverse ecosystems to reduce both costs and losses.

Approximately 10,000 wildfires burn half a million acres on an annual basis in California. While the number of acres burned fluctuates considerably, a more significant trend is the climbing wildfire-related financial losses. From 1947 to 1990, the dollar damages to structures and other resources in State Responsibility Areas (SRA) exceeded \$100 million (2001 dollars) only once. Between 1990 and 2001, losses exceeded \$100 million five times (Figure 1).

Figure 1. Wildfire acres and dollar damage on State Responsibility Area (SRA), 1947-2001



Source: California Department of Forestry and Fire Protection (CDF), various years

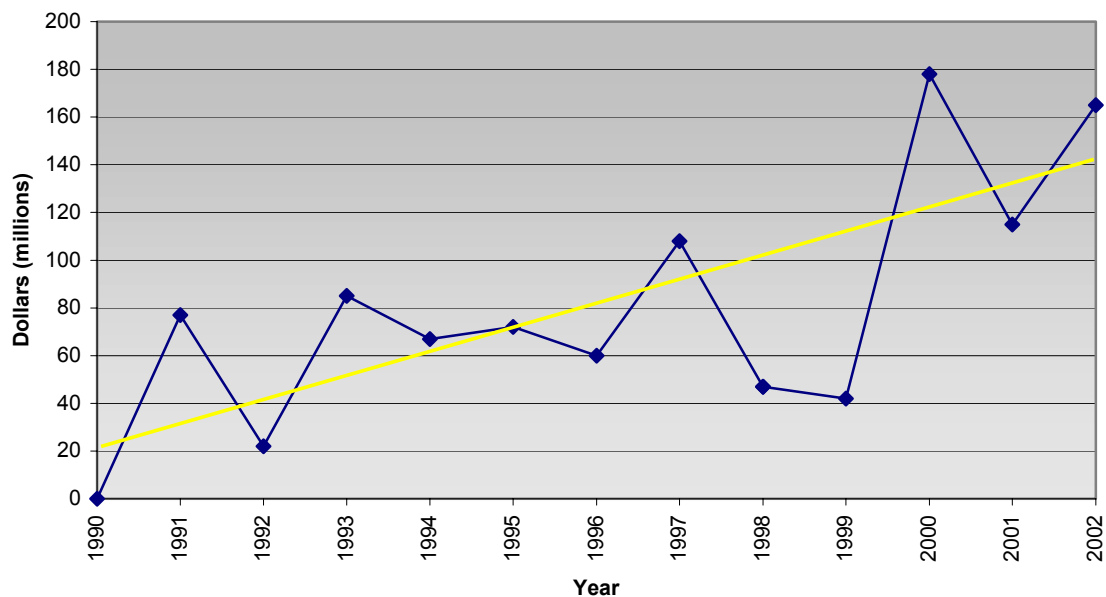
Large and damaging wildfires occur when vegetation fires overwhelm responders during the initial and extended attack phase of fire suppression. Initial attack is the planned dispatch of fire engines, bulldozers, air tankers, helicopters, hand crews, and other specialized equipment. For federal lands, it may also include specialized "smoke jumper" crews who parachute into remote areas of the national forests. CDF's goal for wildland fire protection is to contain 95 percent of fires at 10 acres or less. Statewide, approximately 97 percent of all vegetation fires are contained within the first few hours after they are reported. The three percent that escape do so because they moved too fast or were too intense for the fire

suppression resources available. Multiple large fires can quickly draw down the pool of fire suppression resources, increasing the chances of an escape.

When a fire escapes initial air attack, the costs of fire suppression rise quickly. In the major fire phase, costs for the extensive use of ground and air resources can often exceed one million dollars per day. Extended and major fire attack involves anything from a few five-engine “strike teams” to a full-scale, multi-agency base of operation with logistics, communications systems, food service, command and control systems, financial operations, and other support functions. The total costs of fire protection are measured by State and federal taxpayer expenditures, disaster relief payments, property losses, and insurance premiums. Adding these costs to direct suppression costs provides a more complete picture of the total [costs of wildfire](#) (CDF, 1996).

The costs of extended fire attack are unpredictable and not included in initial annual CDF budget appropriations. Extended fire attack costs for suppressing wildfires on lands where the State has financial responsibility are covered by the State Emergency Fund (E-Fund). A minor share of these costs is eventually reimbursed through the Federal Emergency Management Agency (FEMA). Over the past 12 years, the costs over and above initial appropriations have been on an upward linear trend (Figure 2).

Figure 2. CDF E-fund expenses, 1990-2002



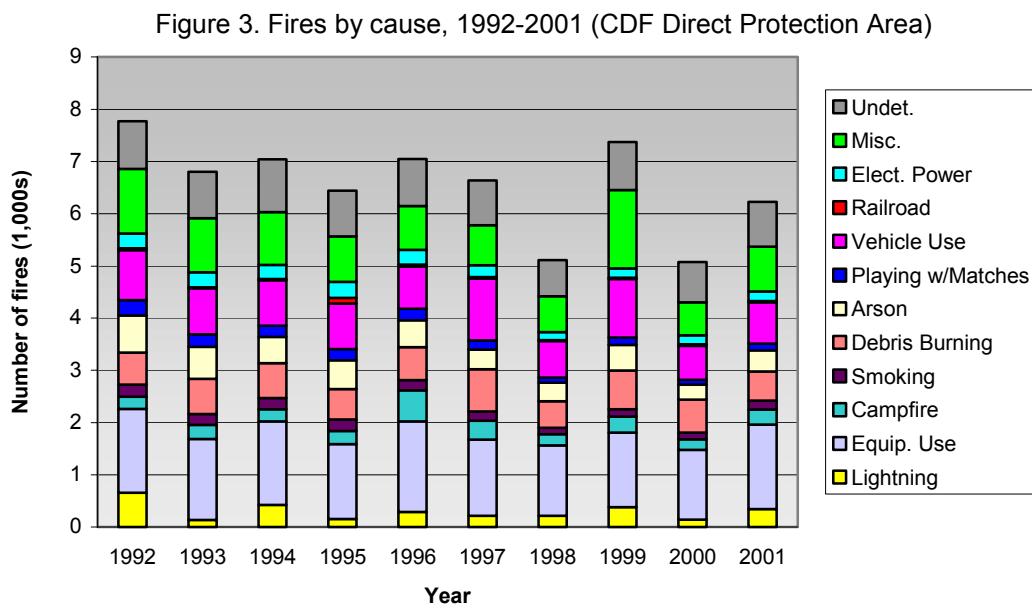
Source: CDF Budget Office, 2003

E-Fund expenditures for fighting fires that escape initial containment accounted for 22 to 64 percent of all California fire suppression costs over the past five fiscal years (CDF Budget Office, 2003).

Wildfire cause

Any small fire, no matter the cause, that is near vegetation close to wildland areas has the potential to ignite other vegetation and quickly grow. A fire ignition may be due to natural causes (lightning); or it may be associated with humans, such as sparks from equipment, arson, or a car burning along the road after an accident. Agencies charged with prevention and control of wildfire respond to fires that come from a wide variety of sources.

CDF records show that human presence is a dominant factor of wildfire ignitions on lands it protects directly with its own forests (Direct Protection Area). Residents and visitors cause the majority of wildfires on these mostly private lands. These records classify the causes of wildfire as vehicle use, debris burning, campfires, smoking, playing with fire, equipment use, arson, lightning, railroads, and power lines. Equipment use, vehicle use, and debris burning are the most frequent identified fire causes (Figure 3).



Source: CDF, Various Years

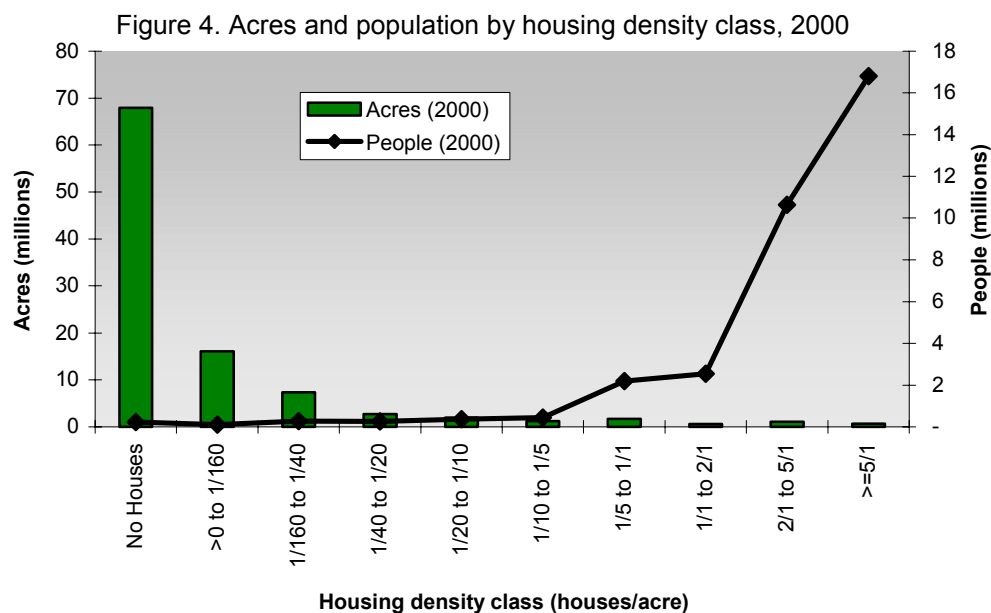
Lightning is more frequent in national forests and national parks, and generally causes a higher percentage of the fires that occur in the higher elevations. Wildfires ignited by a string of lightning strikes sometimes grow into “complexes” comprising hundreds of individual fires, often on difficult terrain and in isolated areas. These complexes are a tactical and strategic challenge that draws heavily on the pool of available suppression resources. For example, in 1999, the lightning-sparked Big Bar Complex burned 140,907 acres over a three-month period. That same year, the Kirk Complex burned 86,700 acres. Together these complexes cost federal agencies \$178 million to control—about 30 percent of the total fire suppression expenditures for that year (U.S. Forest Service (USFS), 2000a). See the online document [Policy Implications of Large Fire Management: A Strategic Assessment of Factors Influencing Costs](#) for more information.

Assets at risk

California is an ecologically rich and diverse state, with land ownership divided nearly equally between the public and private sectors. Within the total area of about 101 million acres are 19 million acres of conifer forests, 10 million acres of hardwoods, and about 25 million acres of brush and grasslands. These forests and rangelands provide forage, recreation, timber, water, habitat, and other ecosystem benefits to all Californians. Severe fires can diminish these desired benefits as well as create air quality and water quality problems. An analysis of these values has been done as part of the California Fire Plan (CDF, 2002e) which is in part updated with this Assessment (see the Assessment document [Wildfire Risk to Assets](#)).

Historically, one of the most significant natural values protected by wildland fire control agencies has been water quality. According to mandates in the Public Resources Code (PRC), protecting watersheds from large and damaging fires is a State interest. Runoff from burned areas and the erosion it causes can damage water quality for downstream users, lead to the loss of reservoir capacity, damage hydropower turbines, and damage streams and related aquatic life.

An expanding asset at risk is the increasing number of residences adjacent to wildland areas. Most Californians live in urban or suburban areas; about 88 percent of the population is located where the density of housing units is one house per acre or greater. This urban/suburban footprint covers 2.3 percent of California's total land area with little of this area adjacent to flammable fuels (Figure 4).



Source: Fire and Resource Assessment Program (FRAP), 2003b

The rest of California is rural, with people interspersed within the natural vegetation. About three million people, or nine percent of the State's population as of the year 2000, were potentially living in areas with houses in densities of between one housing unit per acre to one unit per 20 acres. In these areas wildland fire can spread to structures and structure fires can also ignite vegetation. This has led the wildland fire protection system involving federal, State, and local fire departments to evolve to protect

both public safety and wildland. Landowners increasingly are required to reduce wildfire vegetation hazards.

The impact of human population on wildland fire protection workloads is generally less on public lands than on private lands, largely because housing development is limited or absent on most of the public lands. However, concern about development on the fringes of the public lands also influences federal fire policies. Fire policy emphasizes strategic vegetation treatment to reduce hazards in the national forests and national parks, particularly where there is risk of wildfire spreading to communities.

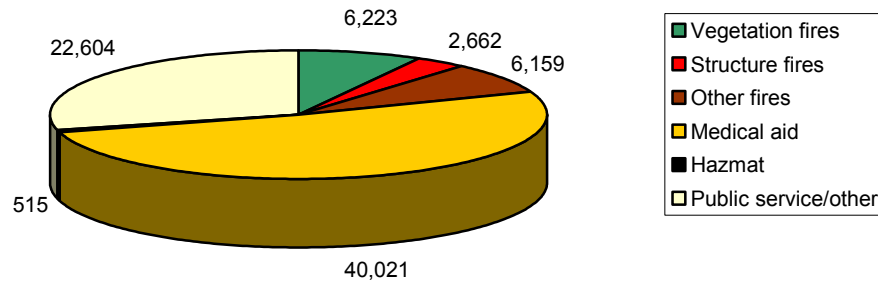
California communities at risk: A list of 847 California communities near federal lands that are at high risk from wildfire can be found in the Federal Register of January 4, 2001. See the online document [Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire](#) for more information (National Archives and Records Administration, 2001).

A comprehensive federal study entitled the [Sierra Nevada Ecosystem Project](#) concluded, “Homes intermixed with flammable wildlands ... place an increasing number of homes and people at high risk of loss from wildfire unless hazards are mitigated. Current fuel levels and projected future uses, especially in the west-central Sierra Nevada foothills and lower mixed conifer zones, are incompatible without active fuel management. The presence of homes can force changes in suppression strategies and increase suppression costs” (Centers for Water and Wildland Resources, 1996).

Non-wildfire emergency services

A growing population increases the pressure on public safety agencies to provide additional services. CDF works with local fire departments and emergency agencies to respond to incidents such as automobile accidents, heart attacks, drownings, lost hikers, hazardous material spills, train wrecks, floods, earthquakes, civil unrest, and other urgent situations. When the Governor has declared a state of emergency, the Office of Emergency Services (OES) has typically called upon CDF to use its specialized capability and expertise to respond to both natural and man-made disasters. In 2001, slightly more than half of all incidents responded to by State and local resources operated by CDF under Schedule A contracts (a cooperative agreement where the California Department of Forestry and Fire Protection provides fire protection service for local agencies) where the State has financial responsibility for protecting natural resources from fire (State Responsibility Areas or SRA) were to render medical aid (Figure 5) (CDF, 2002f). Statewide, inside and outside of SRA, state and local resources operated by CDF under Schedule A contracts responded to about 275,000 non-wildfire emergencies, of which more than half were medical aid calls. See the [CDF Department Overview](#) for more information.

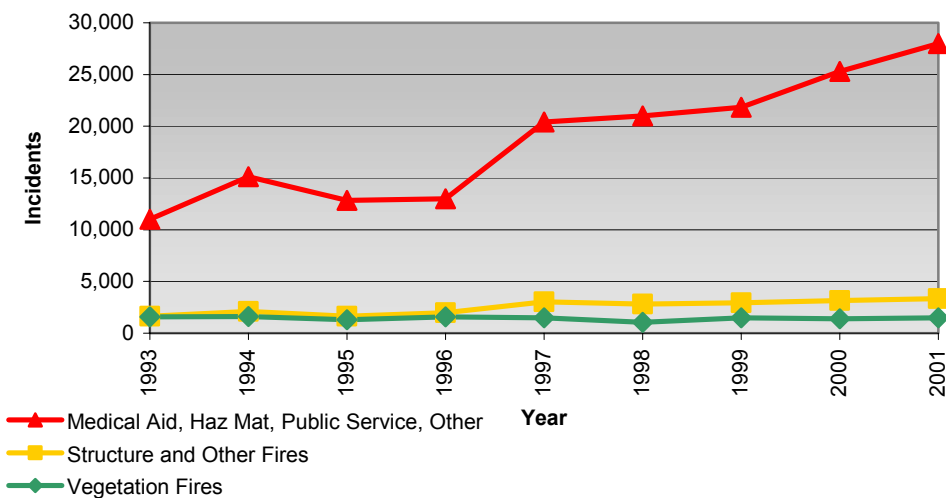
Figure 5. Incident totals CDF Statewide summary, State Responsibility Area (SRA), 2001



Source: CDF, 2001a

Increases in the number of medical aid and other non-fire responses on SRA have increased. For example, in the fast-growing foothill region of the Sierra, which is administered by six different CDF Units, the number of medical aid and non-fire incidents increased from 10,000 to 25,000 between 1993 and 2000 (Figure 6). During this time, the number of fires (both vegetation and other) remained relatively constant.

Figure 6. CDF response trends in the Sierra foothills, State Responsibility Area (SRA), 1993-2001



Source: CDF, various years

Demands on the wildland fire protection system are reflected in workloads increasingly like those of its urban counterparts. Along with local government and volunteers, State agencies such as CDF and OES respond to non-wildfire emergencies when it will not compromise the primary mission of protecting natural resources. For example, during the 1990s, CDF incident command teams worked on the “Cantara Loop” hazardous material spill on the upper Sacramento River, the Northridge and Loma Prieta Earthquakes, the I-880 freeway collapse, and the Cajon Pass train derailment in San Bernardino County.

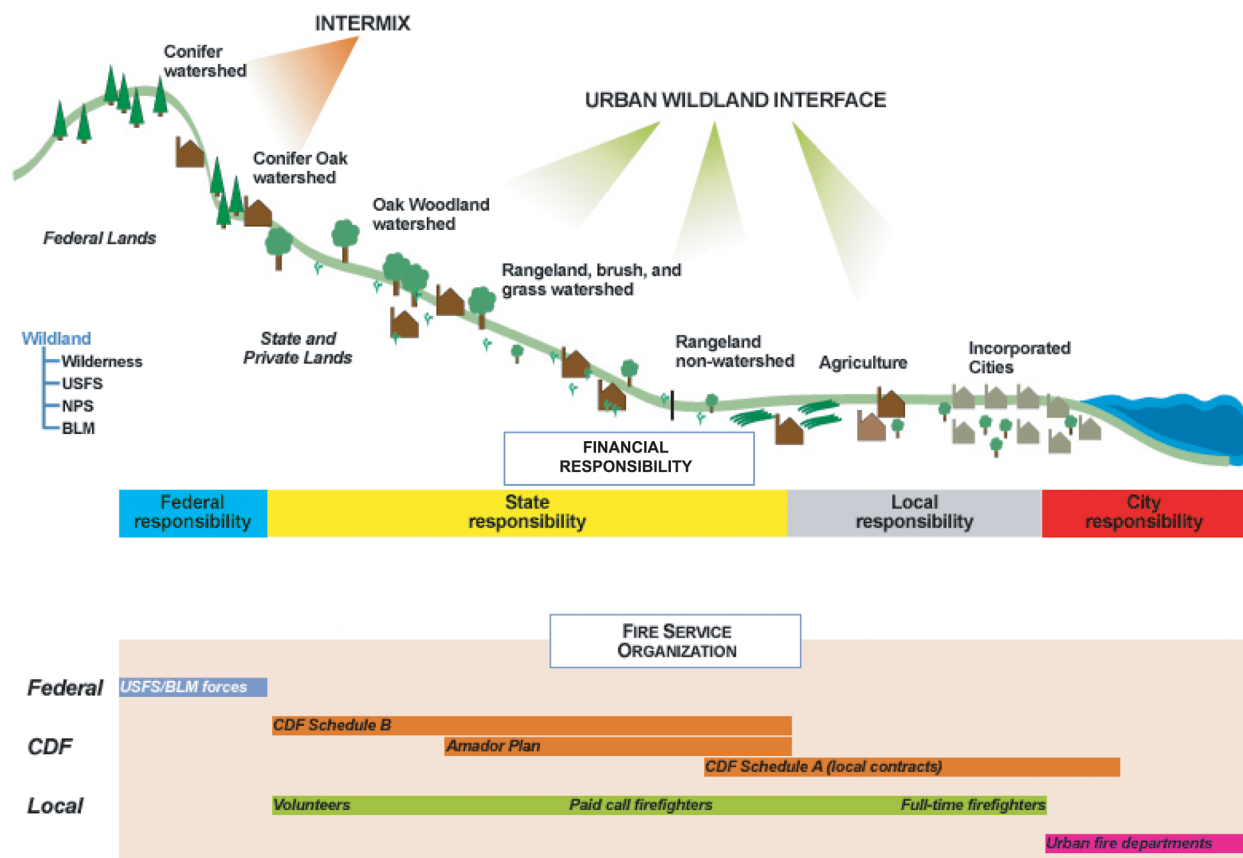
The demand for non-fire emergency services will likely continue to grow throughout California and put pressure on local governments to expand their resources. When rural communities perceive a need to

increase the level of service, they look for ways to acquire additional equipment, engage more firefighters, and increase skill levels. Some options include upgrading volunteer companies to paid professionals, forming or expanding fire protection districts, and entering into contracts with the State for firefighting personnel, equipment, or dispatching services.

Evolution of the fire protection system in California

The wildland fire protection system in California has evolved over sixty years into a highly integrated multi-agency effort (Figure 7). Historically, federal agencies have been responsible for public lands that they manage. CDF provided wildland fire protection for private and State lands with natural resource and watershed values. Areas where the potential fire risk does not threaten watershed values (such as irrigated agriculture) do not receive State fire protection.

Figure 7. Fire Protection System



Source: Gilbert, 2003

Owners of large tracts of land have significant amounts of vegetative assets at fire risk; relatively slow accessibility from the outside, and sometimes a full-time resource management staff. Historically, they have helped reduce fire hazards and have responded to suppress wildfires. For example, fire agencies and ranchers have used prescribed fire to modify vegetation fuel hazards and to improve range values. CDF's Range Management Program, which evolved in 1981 to the Vegetation Management Program, has treated tens of thousands of acres to reduce fuels. The program has multiple objectives that include fuel

hazard reduction and range and wildlife habitat improvement. See the online document [Vegetation Management Program](#) for more information (CDF, 2001b).

Even more significantly, larger timber companies have worked with fire agencies to develop a system of joint information, detection, and response to wildfire starts. These efforts have been most intense in areas of high fire risk to timberland, such as in the northern Sierra Nevada foothills. Timber companies have been especially concerned about periodic high numbers of burned commercial timberland acres—over 126,000 acres in 1937, 45,000 acres in 1945, 66,000 acres in 1955, 92,000 acres in 1977, and 70,000 acres in 1992 (CDF, 2002i).

When people move to rural areas and want a higher level of fire protection, they often pay for it by providing facilities and equipment for volunteer firefighters and then move in phases to the point of hiring full-time firefighting professionals. Local agencies are expected to handle most routine medical aid dispatches, hazardous material spill responses, and public service calls. Changes in fire prevention and land use planning laws over the last decade have also increased both the cost and responsibility born by landowners to anticipate wildfire and reduce its risk.

Today, California has a highly integrated Statewide fire protection system. State and federal agencies, counties, cities and fire protection districts, volunteer fire departments, and private timber companies provide many services and activities that contribute to wildland fire protection (Table 1).

Table 1. Main components of the wildland fire protection system

Services	State	USFS, BLM	Some NPS, DOD, FWS	Counties	Cities, fire protection districts	Volunteer fire departments	Private landowners (including ranchers and timber companies)
Wildfire	X	X		4	4	4	X
Vehicle fire	1		X	X	X	X	X
Medical aid	2		X	X	X	X	
Haz-Mat response	X			X	X	X	
Public service assistance	3		X	X	X	X	
Structure fire	1		X	X	X	X	
Pre-fire management	X	X	X	X	X		X
Post-fire management	X	X		X	X		X
Law enforcement	X	X	X	X	X		
Fire prevention education	X	X		X	X	X	X
Planning	X	X		X	X	X	X
Who pays?	State taxpayers	Federal taxpayers	Federal taxpayers	County taxpayers	Fire district residents	Local residents (donations)	Investors

1 – CDF responds to structure and vehicle fires during wildland fire season when stations are staffed and the fire threatens SRA; 2 – CDF assists in medical aids when available and within its existing budget as authorized by PRC 4114(b); 3 – CDF provides public service aid when available and within its existing budget; 4 – Responds to SRA on Initial Attack through Mutual Aid; 5 – May respond if fire threatens wildland

BLM – U.S. Bureau of Land Management; DOD – U.S. Department of Defense; FWS – U.S. Fish and Wildlife Service; NPS – National Park Service; USFS – U.S. Forest Service

Legal and financial responsibilities

The three largest government fire service agencies (in terms of area protected) with wildland fire responsibilities are [CDF](#), which protects most privately owned lands, [USFS](#), which protects national forests, and [U.S. Bureau of Land Management](#) (BLM), which administers much of the publicly owned lands outside of national forests (CDF, 2002a; USFS, 2002a; BLM, 2002a).

Other public agencies with fire management responsibilities include the [California State Fire Marshal](#) (SFM) the Office of Emergency Services [OES](#), the [California Department of the Youth Authority](#) (CYA), the [California Department of Corrections](#) (CDC), the [National Park Service](#) (NPS), the [U.S. Fish and Wildlife Service](#) (FWS), the [U.S. Bureau of Indian Affairs](#) (BIA), and the [U.S. Department of Defense](#) (DOD) (SFM, 2000a; OES, 2000; CYA, 2000; CDC, 2002; NPS, 2002; FWS, 2002; BIA, 2002; DOD, 2003).

[FEMA](#), although not a wildland fire protection provider, manages disaster relief efforts (FEMA, 2002) and provides considerable federal funding. Local government agencies, such as local fire districts and urban fire departments, also have significant roles.

State law sets out a legal framework that defines the financial responsibility for wildland fire protection. These are the local and State Responsibility Areas, contract counties, and areas of federal responsibility.

Local Responsibility Area (LRA)

Local government entities, which include counties, cities, and fire districts, provide fire protection in highly urbanized areas as well as ex-urban and rural lands. These lands are referred to as Local Responsibility Area (LRA). There are some areas of California where there is no state or local government services, such as fire districts, volunteer or county fire departments, available. Approximately 1,000 fire departments in California respond to the majority of non-wildland fires and emergency responses within the State. The Legislature, through Public Resources Code 4142, gives the CDF Director authority to provide fire protection/emergency services to local governments under contract. Local agencies contract with CDF to provide this fire protection. In 2002, 34 counties, 25 cities, and 33 fire protection districts maintained Cooperative Fire Protection Agreements with CDF for a wide variety of services. Eleven cities maintained Wildland Fire Protection Agreements with CDF in order to augment city fire department resources specifically for wildland firefighting. Additionally, another 22 local governmental entities maintain [agreements with CDF](#) (county service areas and districts, water and power districts, etc.) (CDF, 2002c). Under PRC 4143-44 (the "Amador Plan"), CDF enters into financial agreements to provide structural fire protection with counties during the non-fire season.

State Responsibility Area (SRA)

CDF is responsible for protecting natural resources on approximately 31 million acres designated by the California State Board of Forestry and Fire Protection (BOF) as SRA under California PRC Sections 4125 to 4127 (Legislative Council of California, 2002). SRA includes watershed lands that are covered wholly or in part by timber, brush, undergrowth, or grass, whether of commercial value or not. It does not include lands owned by federal agencies, lands within incorporated cities, or lands without value as watersheds as defined by BOF regulations. BOF removes lands from SRA when housing densities

increase to more than three units per acre over an area of 250 acres unless circumstances dictate otherwise. The agency also reviews all specific changes to SRA every five years. Of California's 58 counties, only San Francisco and Sutter counties have no SRA lands.

Contract Counties

Under Section 4133 of the Public Resources Code and Section 55607 of the Government Code, CDF may contract with counties for protection of SRA. Currently, Los Angeles, Marin, Orange, Santa Barbara, Kern, and Ventura county fire departments protect approximately 3.4 million acres of SRA (CDF, 2002b). CDF allocates funds to these [Contract Counties](#) at least equal to CDF's direct cost of fire protection in that county. When wildland fire escapes initial attack, CDF responds with additional firefighting resources.

Federal Responsibility Area (FRA)

Lands held in public ownership and administered by various federal agencies comprise Federal Responsibility Area (FRA). FRA includes national forests and national parks. BLM, FWS, BIA, DOD, U.S. Army Corps of Engineers, and U.S. Bureau of Reclamation administer the remaining areas.

Direct Protection Area (DPA)

In 1990, through a process called "balancing of acres," agencies delineated the area that they would protect with their own forces in a manner that reduces the overlap of fire station response areas. These DPAs redistributed fire protection responsibilities in more contiguous blocks for a more efficient use of fire suppression resources, avoiding unnecessary reimbursement schemes among agencies providing initial attack services. State, federal and local DPA are defined as follows:

- CDF and contract counties protect the State DPA and SRA. CDF also protects intermingled federal lands.
- Federal DPA includes lands protected by the USFS, BLM, NPS, DOD, and BIA. Federal agencies also protect SRA.
- Local DPA includes lands in private ownership that are not contained in SRA. Local government agencies (cities, counties, fire districts, etc.) provide fire protection, sometimes augmented by CDF under contract.

On an area basis, CDF has the largest DPA (27 percent of California), followed by the USFS and local governments (each of which protects about 22 percent of the land area) (Table 2 and Figure 8).

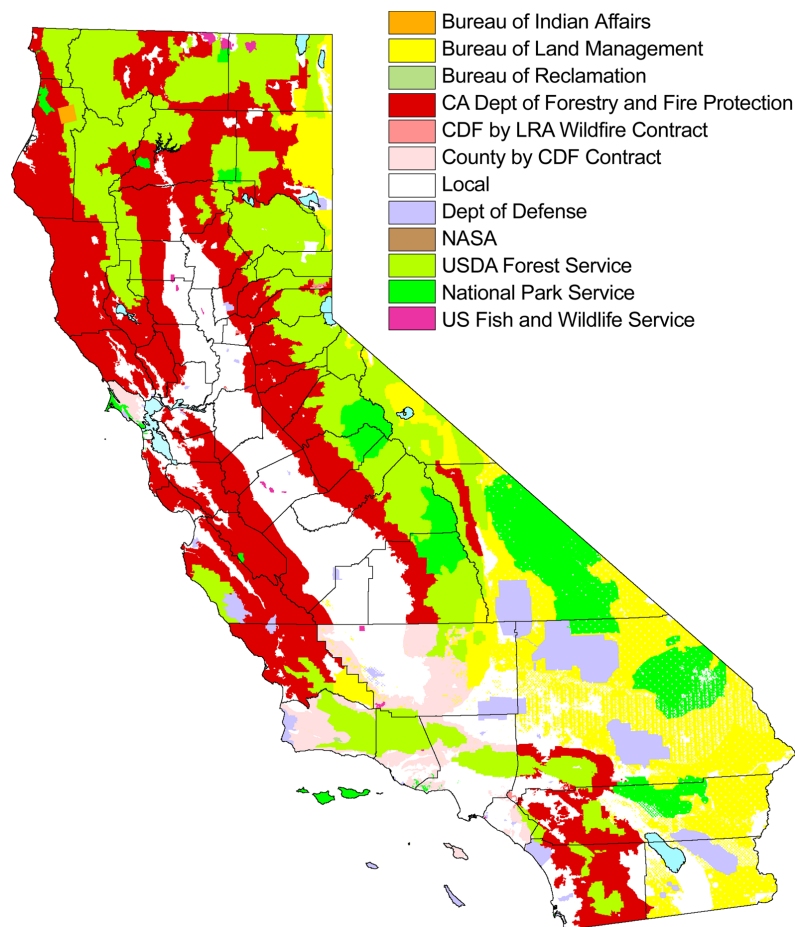
Table 2. Area of Direct Protection Area (DPA)

Fire protection provider	Acres	Percentage
BIA	91,023	0.1
BLM	13,365,586	13.2
USBR	9,793	0.0
CDF	27,533,712	27.2
CDF by LRA Wildland Contract	73,157	0.1
County by CDF Contract	3,460,904	3.4
Local	22,254,935	22.0
DOD	3,953,193	3.9
NASA	1,640	0.0
USFS	22,849,146	22.6
NPS	7,403,096	7.3
FWS	170,101	0.2
Total	101,166,284	100.0

BIA – U.S. Bureau of Indian Affairs; BLM – U.S. Bureau of Land Management; CDF – California Department of Forestry and Fire Protection; DOD – U.S. Department of Defense; FWS – U.S. Fish and Wildlife Service; LRA – Local Responsibility Area; NASA – National Aeronautics and Space Administration; NPS – National Park Service; USBR – U.S. Bureau of Reclamation; USFS – U.S. Forest Service

Source: Compiled by FRAP, 2003a

Figure 8. Direct Protection Area (DPA)



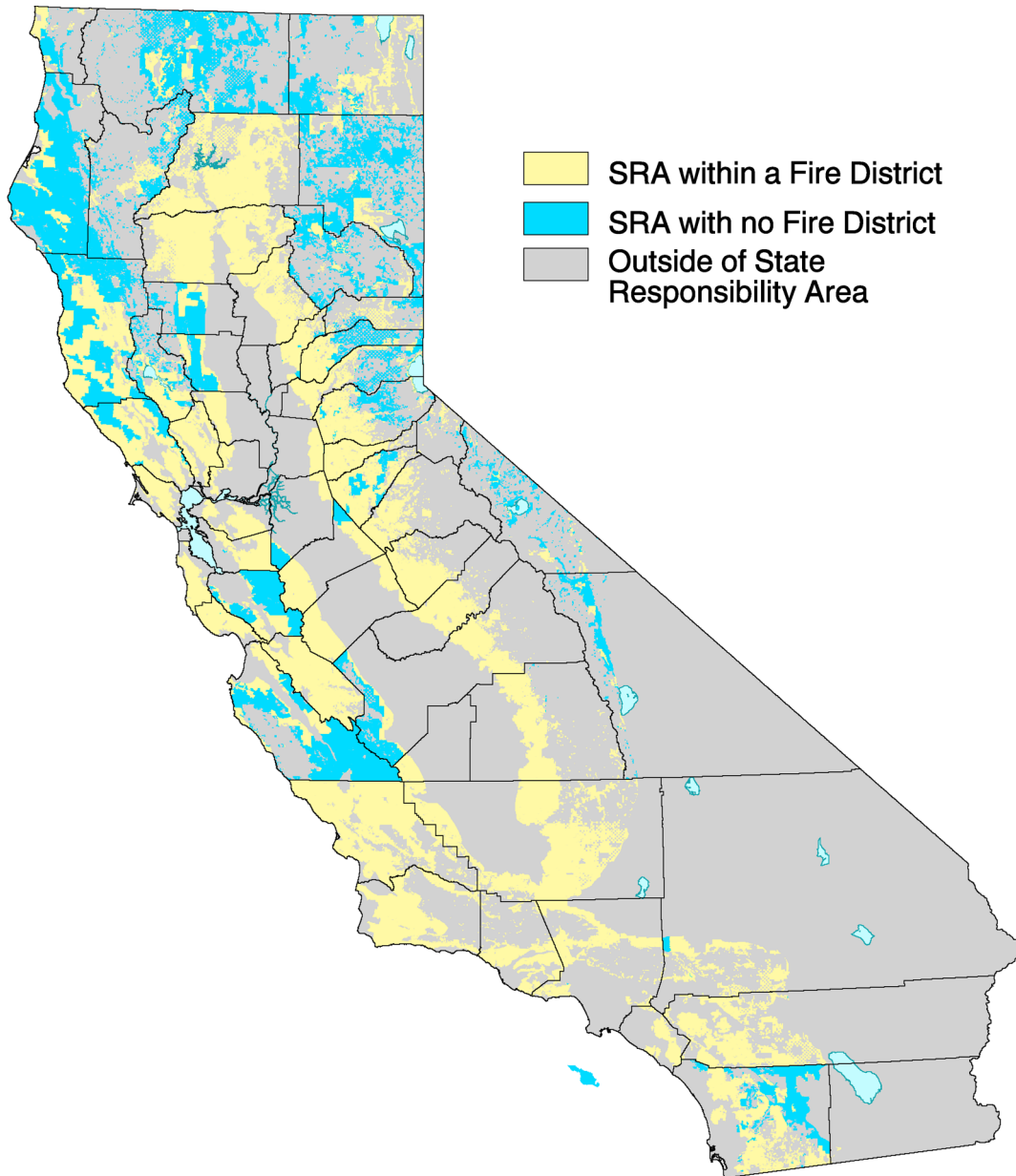
Source: FRAP State Responsibility Areas & Direct Protection Areas (SRA, 1999)

Source: FRAP, 2003a

Coverage by local fire districts

The majority of SRA lands also have local fire districts that provide life and property protection and other public safety services (Figure 9).

Figure 9. State Responsibility Area (SRA) for fire protection within and without fire district boundaries



Source: FRAP, 2003a

About 30 percent of SRA has no local fire districts, but less than five percent of total SRA population live in these areas. In contrast, over 99 percent of the people and structures outside of SRA are in a fire district (Table 3). Areas with fire districts grew significantly faster than areas without fire districts in the 1990s. Population in SRA, where there is a local fire district, grew 18 percent from 1990 to

2000. Where there was no local fire district, the rate of growth was 12 percent. Population in SRA as a whole grew by an estimated 14 percent during the decade. The small number of people involved, the large size of rural census blocks, and the problem of federal land (where people cannot reside permanently) within these census blocks introduce some error into the estimates.

Table 3. Area, population and housing structures by county, 2000

County	Non-SRA			Non-SRA			SRA			SRA		
	Within districts			Outside districts			Within districts			Outside districts		
	Acres	People	Houses	Acres	People	Houses	Acres	People	Houses	Acres	People	Houses
Alameda	272,641	1,442,833	567,579	273	256	104	250,882	11,119	3,824	1,775	3	0
Alpine	280,326	281	97	153,713	17	18	33,511	817	1,124	8,060	37	124
Amador	91,967	9,364	3,846	188	0	0	294,513	25,198	10,713	33	0	0
Butte	544,973	162,139	66,448	879	2	0	526,818	40,095	17,482	672	0	0
Calaveras	107,771	4,782	2,235	27,111	43	15	410,901	31,424	19,551	117,794	3,321	1,664
Colusa	367,733	17,898	6,621	106,053	132	70	100,591	547	354	165,609	249	105
Contra Costa	283,347	925,496	363,763	28,822	308	143	201,185	24,503	8,629	0	0	0
Del Norte	129,405	11,171	4,611	328,929	5	0	93,043	14,761	5,239	97,826	393	210
El dorado	266,395	43,119	24,492	306,247	40	55	437,530	112,196	49,865	136,164	1,366	1,256
Fresno	2,940,878	783,039	271,815	144,304	95	43	482,285	16,868	8,824	283,658	255	115
Glenn	282,909	25,388	9,394	233,322	165	61	103,946	467	168	229,196	427	175
Humboldt	111,765	86,522	35,842	583,779	1,237	525	189,257	24,415	10,122	1,410,110	13,373	6,822
Imperial	2,137,655	144,984	47,816	727,621	84	33	2,169	12	27	0	0	0
Inyo	1,520,539	9,153	4,371	4,801,898	2,223	1,023	33,741	4,529	2,063	188,730	1,993	898
Kern	3,454,112	609,325	215,405	24	2	0	1,769,162	49,611	23,827	3	0	0
Kings	792,744	123,845	38,949	0	0	0	97,791	5,427	5	10	0	0
Lake	125,572	31,079	17,235	326,714	8	88	272,739	25,026	14,397	125,839	1,362	638
Lassen	248,945	22,325	7,075	1,707,514	506	222	148,600	7,453	3,419	915,343	3,272	1,522
Los Angeles	2,024,272	9,448,558	3,366,845	36,705	370	92	507,433	118,632	38,773	46,596	1,117	558
Madera	1,003,877	98,433	31,031	330	0	0	373,864	27,626	12,574	0	0	0
Marin	177,048	208,139	92,206	3,191	0	0	198,926	38,695	14,273	107	0	0
Mariposa	486,587	1,847	1,027				449,591	14,841	7,824	8	0	0
Mendocino	107,767	46,853	18,089	264,730	66	19	922,169	35,135	15,492	953,864	3,530	1,672
Merced	839,292	207,560	67,351	21	0	0	422,376	730	285	300	0	0
Modoc	1,039,342	6,268	2,826	1,012,105	73	33	339,274	2,152	1,080	298,369	589	319
Mono	188,896	6,804	9,554	1,593,379	290	111	53,633	4,008	2,510	168,077	1,173	972
Monterey	462,832	343,906	113,855	368,390	6,953	2,223	343,444	42,306	16,072	946,444	7,054	3,300
Napa	134,631	105,630	42,192	39	0	0	369,795	19,043	7,286	34	0	0
Nevada	52,052	24,742	14,869	164,448	8	4	252,993	64,211	26,594	154,103	1,737	1,199
Orange	366,405	2,808,771	1,014,539	1,214	144	72	143,701	41,702	17,559	28	0	0
Placer	291,632	164,621	67,072	265,487	13	13	273,316	79,366	40,575	129,643	474	1,622
Plumas	119,130	6,655	3,013	1,113,025	281	168	96,212	9,628	6,096	344,297	3,532	2,617
Riverside	3,221,003	1,377,873	566,059	644,205	30	3	808,502	146,494	60,986	113	0	0
Sacramento	518,303	1,217,563	487,089	209	0	0	118,595	4,120	1,561	1	0	0
San Benito	158,498	44,211	14,472	744	0	0	729,824	9,002	3,072	985	6	1
San Bernardino	12,473,759	1,599,619	578,404	8,076	105	53	364,569	93,711	65,194	19,907	4,414	1,948
San Diego	981,902	2,632,999	1,001,396	512,120	16,314	609	745,889	160,407	59,258	472,073	7,470	2,763
San Francisco	68,453	783,576	354,932	0	0	0	0	0	0	0	0	0
San Joaquin	654,468	560,207	193,407	112,028	2,971	581	80,871	1,438	503	65,442	166	47
San Luis Obispo	639,698	185,544	78,859	0	0	0	1,484,761	60,328	22,500	89	0	0
San Mateo	172,182	693,789	268,080	33	20	7	181,007	17,385	6,471	273	1	0
Santa Barbara	883,821	348,114	129,445	125,149	0	0	750,794	52,534	19,512	0	0	0
Santa Clara	267,201	1,673,267	601,804	16,686	461	151	155,910	14,582	5,023	394,465	4,063	1,555
Santa Cruz	50,730	185,095	73,339	0	0	0	234,679	71,263	28,467	491	35	8
Shasta	1,087,273	107,562	43,484	2,078	8	2	1,372,322	55,465	23,024	591	6	2
Sierra	296,227	962	450	157,127	183	73	98,560	1,945	1,367	63,671	346	259
Siskiyou	135,532	22,222	9,800	2,553,771	823	365	187,955	10,757	4,777	1,184,787	9,624	4,544
Solano	493,531	380,962	133,119	109	7	1	86,696	10,824	3,934	0	0	0
Sonoma	211,752	388,946	155,799	19,492	489	116	584,678	64,306	30,844	210,485	4,131	2,120
Stanislaus	514,948	442,883	156,948	6,140	397	134	399,774	2,521	931	48,564	164	58
Sutter	389,096	78,637	29,291	537	4	1	0	0	0	0	0	0
Tehama	611,862	41,258	16,668	636	0	0	1,283,047	13,792	5,652	181	0	0
Trinity	249,386	8	8	1,309,085	43	41	144,779	10,004	5,013	349,580	2,475	1,906
Tulare	1,963,196	355,488	114,821	524,031	230	449	607,681	11,070	7,119	1,987	15	33
Tuolumne	1,093,928	6,816	3,684	1,651	0	0	360,033	47,137	24,035	9	1	0
Ventura	799,855	711,970	240,607	15,250	28	0	373,246	43,366	15,884	0	0	0
Yolo	452,282	166,245	62,101	25,408	296	92	176,835	1,563	706	48	0	0
Yuba	185,465	51,036	17,940	11,547	260	102	202,218	8,423	3,547	12,616	277	95
California total	49,827,794	31,988,380	11,864,071	20,346,565	35,988	7,913	21,728,619	1,804,980	786,005	9,549,048	78,451	41,129
1990 totals		28,032,173	10,391,724		32,009	7,107		1,542,252	668,339		70,735	36,835
percent growth		14.1	14.2		12.4	11.3		17.0	17.6		10.9	11.7

Sources: FRAP, 2003b

Seven counties contain two-thirds of all SRA population in areas where there is no local fire district. Humboldt and Siskiyou counties maintain a large percentage of people in SRA, but local fire districts cover less than 15 percent of the land area (Table 4). San Diego, Monterey, San Bernardino, Sonoma, and Santa Clara counties contain large expanses of rangeland on the outskirts of metropolitan areas.

Table 4. Area, population and housing structures for selected counties in SRA, within and outside of local fire districts

County	SRA			SRA			SRA		
	Within districts			Outside districts			Percentage within districts		
	Acres	People	Houses	Acres	People	Houses	Acres	People	Houses
Humboldt	189,257	24,415	10,122	1,410,110	13,373	6,822	12	65	60
Siskiyou	187,955	10,757	4,777	1,184,787	9,624	4,544	14	53	51
San Diego	745,889	160,407	59,258	472,073	7,470	2,763	61	96	96
Monterey	343,444	42,306	16,072	946,444	7,054	3,300	27	86	83
San Bernardino	364,569	93,711	65,194	19,907	4,414	1,948	95	96	97
Sonoma	584,678	64,306	30,844	210,485	4,131	2,120	74	94	94
Santa Clara	155,910	14,582	5,023	394,465	4,063	1,555	28	78	76
California	21,728,619	1,804,980	786,005	9,549,048	78,451	41,129	69	95.8	95.0

Sources: FRAP, 2003a

Landowner responsibilities

Property owners and land managers are subject to [permitting and fire safety statutes](#). These statutes require “defensible space”—cutting back natural vegetation 30 feet or more around structures, roof standards, etc. (CDF, 2003). Sellers of residential real property located in [Very High Fire Hazard Severity Zones](#) (VHFHSZ) or in a [Wildland Fire Area \(SRA\)](#) must file a Natural Hazard Disclosure (NHD) statement (California Environmental Resources Evaluation System, 1996a and 1996b). During the 1999-2000 legislative session, [Assembly Bill 248](#) (AB 248, Chapter 876, 1999) clarified NHD requirements, giving specific descriptions as to when NHD is or is not required and designating the timing of disclosure prior to escrow while providing for buyers’ cancellation rights if disclosure is late or if the hazard situation is deemed unacceptable (Legislative Council of California, 1999). The latest approved form can be found at Section 1103.2(a) of the California Civil Code (California Environmental Resources Evaluation System, 1996c).

New construction and development in SRA must meet minimum wildfire protection—“fire safe” standards that provide for emergency access, signing and building numbering, private emergency water supplies, and vegetation modification (Section 1270 et seq. of Title 14 of the California Code of Regulations).

Within VHFHSZ in LRA, all new buildings must have a Class A roof. If there are any repairs or replacements including those on existing buildings where 50 percent or more of the roof area is re-roofed within one year, the entire roof covering must be replaced with Class A materials. If the local jurisdiction adopts the SFM’s Model Ordinance for the Defensibility of Space and Structures and transmits a copy of that ordinance to CDF, Class B materials are allowed. For all other SRA, a minimum of Class B materials must be used under the same circumstances as explained above (SFM, 2000b).

Depth and coordination of fire protection forces

There is a mutual understanding among fire agencies that under severe fire conditions no single entity's resources will be sufficient to control multiple wildfires. As a result, several agreements between various levels of government have provided a structure of wildland fire protection that is both cooperative and coordinated. State and federal agencies entered into a [Cooperative Fire Protection Agreement](#) that guides interagency cooperation between BLM, NPS, USFS, and CDF (BLM, 2002b). This Agreement provides terms and conditions for interagency cooperation, delineating coordination of fire protection responsibilities, joint use of resources, cost apportionment, and other provisions relative to the use of shared resources. Most importantly, it specifies that the "closest forces" are to respond, regardless of the agency. The [California Fire Assistance Agreement](#) between OES and wildland fire protection addresses the cooperative use of local resources for fire suppression (OES, 2002).

Cooperative fire protection provides terms and conditions for interagency cooperation, joint use of resources, and cost apportionment.

A number of counties have SRA, but limited CDF personnel or equipment available to respond immediately (CDF, 2002g). Several examples are shown below in Table 5. In such areas, local government may respond to wildland fires as well as non-wildland fires and other non-emergencies.

Table 5. Local fire stations services to rural areas

County	SRA acres	CDF presence	Local county presence
Alameda	251,768	(1) Station	(11) County Stations
Alpine	41,643	No Facilities	(2) County Stations
Colusa	266,141	(1) Station	(1) County Station
Contra Costa	194,943	(1) Station	(28) County Stations
Imperial	2,110	No Facilities	(1) County Station
Inyo	222,523	(2) Stations and (1) Conservation Camp	(0) County Stations
Kings	97,936	No Facilities	(11) County Stations
Sacramento	118,134	No Facilities	(31) County Stations
San Joaquin	146,813	(1) Station	(0) County Stations
Sierra	162,427	No Facilities	(3) County Stations
Stanislaus	448,801	(1) Station	(7) County Stations

CDF – California Department of Forestry and Fire Protection; SRA – State Responsibility Area

Source: CDF, 2002g

When a local government jurisdiction is overwhelmed, provisions of the California Fire Services and Rescue Mutual Aid System's Mutual Aid Plan provide for assistance utilizing State resources without reimbursement (California Emergency Services Act). When State resources are overwhelmed, federal agencies provide assistance to presidential declared disasters and emergencies.

Fire fighting philosophies and resources: CDF's system is based on aggressive initial attack designed to prevent small fires from becoming large. Equipment and forces are positioned to provide relatively uniform rapid response. The mix of forces has changed over time with increased emphasis being placed on air tankers and helicopters that are more mobile and flexible.

CDF also maintains a level of forces and command and control structure sufficient to respond to perhaps 8 to 10 extended attack fires at once and to contain at least 95 percent of all fires at 10 acres or less. Through arrangements with other fire agencies, especially local agencies, CDF stations are usually covered by backup engines when normally assigned engines go to a fire. Many of these engines are owned by local government and operated by CDF under local government contracts. In fact, CDF operates more engines under contract to local government than CDF and the USFS wildland engines combined (Table 6). Local fire districts also provide additional backup and depth.

USFS and BLM fire management programs are guided by similar initial attack principals but have traditionally been funded according to expected economic costs and benefits (especially timber and recreation values). Within these financial constraints, a policy of containing fires when they are small is followed. In certain circumstances, however, Fire Management Plans may allow managers to permit fires to burn unchecked to improve or maintain resource values. Federal forces spread strategically across the national forests in California and nationwide can be drawn upon when more help is needed to fight large fires (Table 6).

Table 6. California wildland firefighting resources (approximate)

Resource	Number available
Personnel	
Full time fire professionals, foresters, and administrative employees (CDF)	3,800
Seasonal firefighters (CDF)	1,400
Inmates, wards, and CCC members (195 fire crews)	4,300
Volunteers in Prevention (Local/CDF)	2,600
Full-time fire management personnel (USFS)	1,059
Part-time or occasional fire personnel (USFS)	1,068
Seasonal or short-term personnel (USFS)	2,461
Casual employees (USFS)	4,551
Timber industry employees	Varies
Ground resources	
Fire stations (CDF-owned)	229
Fire stations (local government owned, CDF operated)	405
Conservation camps (CDF/CDCC/CYA/CCC operated)	41
Fire engines (CDF owned and operated)	370
Fire engines (local government owned, CDF operated)	689
Fire engines (USFS owned and operated)	270
Fire engines (State owned, operated by OES)	110
Rescue squads (CDF owned and operated)	105
Aerial ladder trucks (CDF owned and operated)	13
Bulldozers (CDF owned and operated)	62
Mobile communication centers (CDF owned and operated)	5
Mobile kitchen units (CDF owned and operated)	11
Air resources	
Grumman S-2T 1,200 gallon air tankers (CDF owned and operated)	13
Grumman S-2A 800 gallon air tankers (CDF owned and operated)	10
Lockheed P-3 Orion 2,000 gallon air tankers (USFS owned and operated)	12
Call-when-needed aircraft – SP-2H, P2V, P-3A, C-130A, C-54D, etc. (private)	Varies
Lockheed C-130 aircraft and crews (DOD)	Varies
UH-1H Super Huey helicopters (CDF owned and operated)	9
Helicopters (USFS owned and operated)	23
OV-10A air attack coordination aircraft (CDF owned and operated)	13
Air attack bases (CDF owned and operated)	13
Air attack bases (USFS owned and operated)	9
Helitack bases (CDF owned and operated)	9
Airborne Infra-red Imaging System aircraft (CDF owned and operated)	1
Lookouts (CDF owned and operated)	24
Lookouts (USFS owned and operated)	170
Interagency Hotshot Crews (USFS, BLM, County)	23
Operated by contract counties (CDF funded)	
Fire stations	68
Fire engines	82
Bulldozers	12
Lookouts	1
Fire prevention officers	10
Emergency command centers (partial funding)	6

BLM – U.S. Bureau of Land Management; CCC – California Conservation Corps; CDG – California Department of Corrections; CDF – California Department of Forestry and Fire Protection; CYA – California Department of the Youth Authority; DOD – U.S. Department of Defense; OES – California Office of Emergency Services; USFS – U.S. Forest Service

Source: CDF, 2002d and 2002h; Global Fire Net, 2000; Northern California Spectrum, 2002; USFS, 2001 and 2002b

Much of today's operational use of wildland fire infrastructure is organized around a model developed by the Firefighting Resources of California Organized for Potential Emergencies (FIREScope) project. FIREScope is a cooperative effort involving all agencies with firefighting responsibilities in California and was organized after the disastrous 1970 wildland fires in southern California. This effort led to the development and implementation of the Incident Command System (ICS). Fire agencies use ICS for incident command and multi-agency coordination. The ICS manual spells out the operational and logistical details for the three phases of wildland firefighting: initial attack, extended attack, and major fire.

Challenges

Development impacts

California already has both a diverse and widespread wildland-urban interface, where cities adjacent to forests and rangelands constitute the greatest numbers of housing units at risk from wildfire. In some bioregions, extensive areas of low density housing with a more dispersed configuration dominate the landscape. Development pressure appears to be causing the expansion of both of these pattern profiles, indicating an overall increase in wildfire risk over time in the absence of implementation of major mitigation strategies.

Over the next 40 years, development is expected to impact approximately 2.6 million acres of private forests and rangelands (Table 7). Rangeland cover types (Forest and Woodland Hardwood, Shrub, Grassland, Desert) will experience the most development, potentially reaching 2.2 million acres by 2040.

Table 7. Projected area and percentage of current private, undeveloped land cover classes potentially impacted by new development* by decade to 2040 (thousand acres)

Land cover type	2000 undeveloped land base	Area developed at density of at least one house per 20 acres				Total 2000-2040	Percentage change 2000 to 2040
		2000-2010	2010-2020	2020-2030	2030-2040		
Conifer Forest	5,560	105	58	85	95	343	6
Conifer Woodland	425	6	2	4	5	17	4
Hardwood Woodland	3,630	147	103	101	113	463	13
Hardwood Forest	2,394	95	54	74	78	300	13
Grassland	8,144	190	134	145	177	646	8
Shrub	4,156	165	175	88	85	514	12
Desert Shrub and Woodland	3,078	51	82	45	91	269	9
Wetland**	122	1	0	1	0	3	2
Total	27,510	760	608	543	644	2,554	9

*housing density of one or more units per 20 acres

**Only the Wet Meadow CWHR habitat type is considered forests and rangelands

Source: FRAP, 2002; FRAP 2003c

This level of projected development will impact four major categories: 1) the rising number of structures and parcels will increase the difficulty of coordinating fuel reduction and fire control activities; 2) the risk of fire escaping onto lands used to produce timber, forage, and water will probably increase; 3) the risk of wildfire causing damage to homes and people probably will grow; and 4) the demand for fire protection and emergency services will increase.

Increasing costs of protection

The CDF budget, about 90 percent of which is allocated to fire protection programs, has risen modestly in real terms over a decade, from \$508 million (2001) in fiscal year (FY) 1989-1990 to about \$600 million in FY 2001-2002. Much of the increase is due to budget accounting practices related to the extraordinary costs for fighting large fires. Base funding for emergency fire suppression was \$20 million until 2001-02, when it was increased to \$55 million in recognition of past under-budgeting. Such costs had regularly exceeded the base amount allocated for these purposes, and may still do so, requiring the department to continue to seek additional funding through deficiency appropriations (California Legislative Analysts Office, 2002). Nearly two-thirds of CDF's budget comes from the State General Fund. The remainder comes mainly from federal funds and reimbursements, and from various other State funds.

CDF's base budget process is predicated on the Fire Management Plans prepared by each unit. A systematic and comprehensive analysis of fire hazards (fuels and severe fire weather), assets at risk, and the level of service identifies and ranks high risk and high value areas. Fire managers and community groups work together to identify areas that have the greatest potential for adverse impacts from wildfires and opportunities for cooperative efforts. Projects from all units are then prioritized at the Statewide level.

Federal fire protection costs are increasing and have attracted a high level of congressional attention. After remaining mostly flat nationally through the 1970s and 1980s, federal wildfire suppression costs shot upward starting in the mid-1990s. Costs exceeded \$1 billion for the first time in 2000 and did so again in 2002.

Depth of forces

One of the key ingredients in the ability to fight multiple escaped fires in California is to have an adequate depth of forces to draw from that can respond in a timely manner. Maintenance of an appropriate resource pool relies on an efficient working relationship between fire agencies, and remains a challenge primarily due to two factors:

One factor is the loss of knowledgeable people. Both CDF and the USFS have traditionally drawn from a pool of agency non-fire personnel, as well as others such as loggers, foresters, and heavy equipment operators, to work on large fires. The numbers of these personnel have declined in recent years. One cause has been decreased harvesting and fewer personnel working in the woods that could report or respond to wildfire. Another cause has been the decreased interest of non-firefighting personnel in the USFS and BLM to maintain sufficient training to be qualified to fight fires as a collateral duty as they did in the past (U.S. General Accounting Office, 1999). For a variety of reasons, the number of USFS personnel with this capability declined in the 1990s. The National Management Review Team agreed in [An Agency Strategy for Fire Management](#) that the USFS's ability to manage large fires would be compromised unless there is "significant organization change" (USFS, 2000b).

A second factor relates to the ability to continue some fire protection agreements (such as Schedule A and Amador Plan). For a variety of reasons, including continued population growth and increased costs of fire personnel, pressure to change existing fire protection contracts could bring about different arrangements between fire agencies. It remains to be seen if this will happen and if new arrangements would lessen the depth or efficiency of firefighting forces.

Opportunities

Opportunities to address the major challenges to the fire infrastructure—development impacts, increasing costs, and loss of depth—are numerous and often interrelated. For example, efforts to reduce the increasing risk of wildfire related to development may help to address increasing costs and loss of depth. Similarly, addressing questions related to the depth of forces and increasing cost may also be relevant to lessening the impacts of development. Examples of opportunities are described in what follows.

Fire planning and enhanced budgets

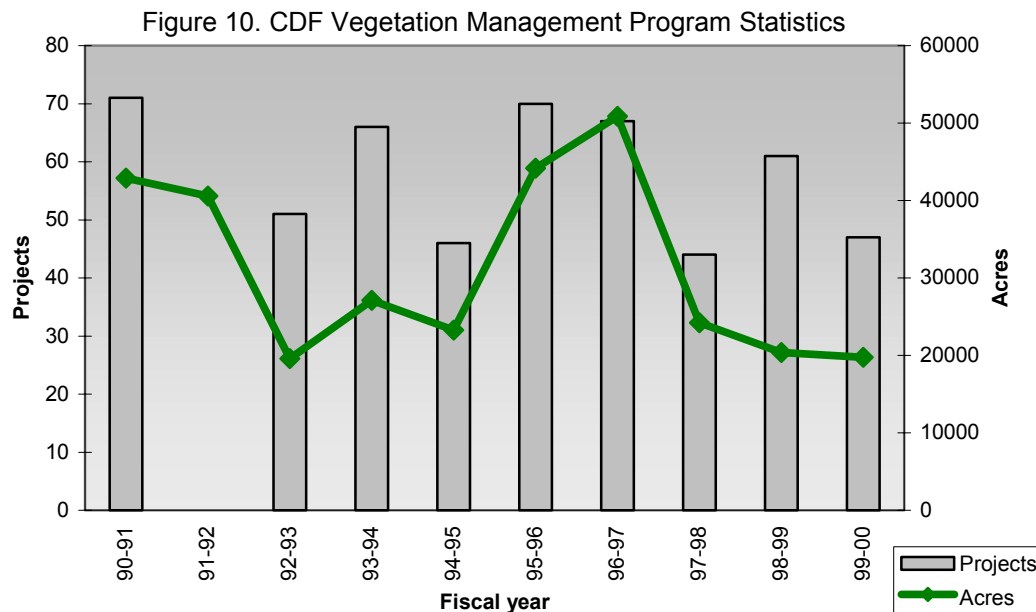
The [California Fire Plan](#) is the State's road map for reducing wildfire related costs and losses through vegetation management in the wildland-urban interface (CDF, 2002e). The Plan provides an

analytical framework that identifies priority locations for projects that could reduce the potential for loss due to wildfire. Fire managers and community groups work together to identify strategies that protect natural resources and other assets at risk, such as homes, using prescribed burning or mechanical fuel reduction methods.

At the national level, the damages and high costs of large fires across the West convinced Congress to increase funding for initial attack of wildfires by federal fire agencies in an effort to prevent fires from becoming larger and more catastrophic. This occurred as part of the development of the National Fire Plan. The [National Fire Plan](#) is a cooperative, long-term effort maintained by the USFS, U.S. Department of the Interior, and the National Association of State Foresters (National Fire Plan, 2002d). The Plan seeks to reduce the impacts of unwanted wildland fires on communities, natural resources, and cultural resources. The Plan has five strategic components including firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability. In California, the USFS budget allocation for fire protection, rehabilitation and restoration, hazardous fuel treatment, research, forest health, and community assistance totaled \$263 million for FY 2002 (National Fire Plan, 2002a). The budget of the U.S. Department of the Interior allocated for firefighting, rehabilitation and restoration, hazardous fuel treatment, research, and community and rural fire assistance for FY 2002 was \$46 million (National Fire Plan 2002a).

Fuel reduction efforts

To help with fuel reduction efforts, the State provides for cost sharing with private landowners under CDF's Vegetation Management Program. The program supports removal of fuels via mechanical methods, burning, and other techniques. Historically, burning has been the method used to treat the most acres. During the 1990s, California's Vegetation Management Program burned an annual average of about 31,000 acres. The average annual number of projects was 58 (Figure 10) (CDF, 2001b).



Note: data unavailable for projects in 1991-1992

Source: CDF, 2001b

At the national level, federal agencies budgeted \$68 million in FY 2002 for hazardous fuel treatments in California targeting about 144,000 acres. About half of these acres are located in the wildland-urban interface (National Fire Plan, 2002a). Acreage targets are rarely met due to the difficulty of finding acceptable conditions for burning. Occasionally, mechanical methods offer a more achievable alternative for reducing fire hazards; however, they are more costly. Biomass may offer more alternatives, but its development is highly dependent on the market price of electricity. See the Assessment document [Forest and Range Related Energy Industry](#) for more information.

The USFS budget for each national forest is partly determined on the use of the National Fire Management Analysis System (NFMAS). NFMAS is a computer analysis of the initial attack system and is used to evaluate budget options at various percentages around the Most Efficient Level (MEL). MEL is an economic criterion that identifies the program funding level that minimizes the sum of pre-suppression costs, suppression costs, and net value change. Net value change recognizes the benefits of fire as well as the costs and is highly dependent on timber stumpage values. Nationally, however, only 30 to 35 percent of agencies' total fire budgets consist of resources planned and justified by initial attack analysis programs (National Academy of Public Administration, 2002). As of July 2002, the National Fire Plan proposed 100 percent MEL funding to federal agencies that would greatly enhance their fire protection capabilities (California Fire Alliance, 2002c).

Does fuels reduction work? [The California Fire Alliance](#) reported that in the fall of 1997, BLM and CDF performed a prescribed burn in the Mill Creek drainage to break up the continuity of the aging chaparral. Previously, arson fires burned thousands of acres in 1960 and 1981 at considerable costs and losses. Another arsonist's fire in 2001 (after the treatment) was controlled at less than 10 acres. There are other similar success stories where wildfires were slowed or stopped when they reached completed fuels reduction projects (California Fire Alliance, 2002d).



Source: California Fire Alliance, 2002d

The Role of Insurance Companies

Wildfire related insurance losses and efforts to reduce their probability are rarely used to affect premium rates. These losses are often a small part of the risk pool that incorporates losses from water damage, earthquakes, tornados, and other large-scale disasters as well as wildfire. Insurance companies are exploring the potential for identifying areas of excessively high risks and adjusting premiums accordingly. If the trend of increasing losses continues, insurance customers in hazardous wildland areas may see insurance premiums increase in the future.

Community and citizen involvement

State and federal fire planning involves private citizens and communities. The public gets involved in a number of ways through Fire Safe Councils and volunteer programs (such as CDF's Volunteers In Prevention program). Over 90 local Fire Safe Councils have formed in California, promoting fire safety,

fire prevention, and fire safe communities. There is also the Statewide [Fire Safe Council](#) composed of 50 public and private organizations (The Fire Safe Council, 2003). In 2001, the National Fire Plan provided \$3.7 million in grants to fund more than 100 fire safety programs in California. In 2002, the California Fire Alliance has recently signed a [Charter](#) for the coordination of cooperative pre-fire projects and programs across the State (California Fire Alliance, 2002a and 2002b).

The California Fire Plan routinely supplies private landowners with information regarding fire threats and hazard mitigation in order to encourage private participation. Federal community assistance programs concentrate on “building state and community capacity to develop and implement citizen-driven solutions that will lessen local vulnerability to risks associated with wildland fires” (National Fire Plan, 2002b). See the online document [Community Assistance Programs](#) for more information. Additionally, the USFS is a sponsor of the [Firewise](#) organization for people who live or vacation in fire-prone areas of North America.

Local subdivision requirements and structural factors

Much can be done in the design of subdivisions and homes to minimize the risk of wildfire. Some factors are guided by State law and regulations. Examples include road access for fire engines, visible street signs and house numbers, clearance around structures, and fire-resistant roofing. Other things depend on local government such as subdivision design and building code standards that lessen the risk of wildfire. Landowners can also take steps to protect themselves against wildfire including the following: 1) use of fire-resistant materials for home construction; 2) employing landscaping that will not burn easily; and 3) creating additional clearance around their structures.

New technologies

State and federal agencies have long recognized [fire science research](#) and technology development as a critical foundation for the future (National Fire Plan, 2002c). The wildland fire protection infrastructure has benefited from advances in firefighting technology and from an increased understanding of the ecological role of fire. State and federal researchers have developed models that help agency decision makers determine the degree of fire danger, plan budgets, and analyze air quality impacts from prescribed burning. Sharing of maps and data through the Internet will continue to increase substantially.

Economic development based on small woody materials

Fuel reduction and other forest management activities create large volumes of small diameter woody materials. Historically, it has been difficult to utilize these materials. Where economics permits, they have been used for biomass fuel and various wood products. As part of the National Fire Plan, the USFS is expanding research into development of new technology and business development for such things as engineered wood products, pelletized fuel, compost, electricity, and small log structures. Additional research is being conducted through funding by the U.S. Department of Energy and the California Energy Commission to evaluate potential contributions of forest biomass to energy and fuels related products.

Glossary

BIA: U.S. Bureau of Indian Affairs.

BLM: U.S. Bureau of Land Management.

BOF: California State Board of Forestry and Fire Protection.

CCC: California Conservation Corps.

CDC: California Department of Corrections.

CDF: California Department of Forestry and Fire Protection.

CYA: California Department of the Youth Authority.

defensible space: Adequate space (free from flammable vegetation) between structures and flammable vegetation, that allows firefighters a safe working area from which to attack an oncoming wildfire.

Direct Protection Area: An area in which wildland fire protection is provided by law or pursuant to an agreement.

DOD: U.S. Department of Defense.

DOI: U.S. Department of the Interior.

DPA: See **Direct Protection Area**.

extended attack: Occurs when a wildfire escapes containment after initial attack.

Federal DPA: Areas in which the federal government provides wildland fire protection.

Federal Responsibility Area: An area in which the federal government maintains the primary financial responsibility for preventing and suppressing fires.

FEMA: Federal Emergency Management Agency.

FIRESCOPE: Firefighting Resources of California Organized for Potential Emergencies.

FRA: See **Federal Responsibility Area**.

FRAP: California Fire and Resource Assessment Program.

FWS: U.S. Fish and Wildlife Service.

FY: Fiscal year.

helitack: A firefighting resource that combines a helicopter, water dropping ability, and a ground attack firefighting crew. **IAA:** Initial Action Assessment.

ICS: Incident Command System.

initial attack: A pre-determined dispatch of fire engines, bulldozers, hand crews, helicopters, or air tankers based on expected firefighting conditions, such as the intensity of the fire, the physical terrain, and the assets at risk. A strategy to contain a wildland fire within a set time or size limit (such as two hours or 10 acres).

interface: See **wildland urban interface**.

ladder fuels: Ladder fuels occur where vegetation is arranged in vertical layers acting as a “ladder” to promote fire spreading upwards from ground fuels to forest canopy fuels.

Local DPA: Areas in which a local government entity provides wildland fire protection.

Local Responsibility Area: Areas in which local government has the primary financial responsibility for preventing and suppressing fires.

LRA: See **Local Responsibility Area**.

MEL: Most Efficient Level.

NFMAS: National Fire Management Analysis System.

NHD: Natural Hazard Disclosure.

NPS: National Park Service.

OES: California Office of Emergency Services.

prescribed fire: A deliberate burn of wildland fuels in either their natural or modified setting and under specific environmental conditions which allow the fire to be confined to a predetermined area and intensity to attain of planned resource management objective (Helm, 1998).

PRC: Public Resources Code.

SFM: California State Fire Marshal.

SRA: See **State Responsibility Area**.

Schedule A: A cooperative agreement contract where the California Department of Forestry and Fire Protection provides fire protection service for local agencies.

State DPA: Areas in which CDF provides wildland fire protection.

State Responsibility Area: Areas in which the State has the primary financial responsibility for preventing and suppressing fires.

USBR: U.S. Bureau of Reclamation.

USFS: U.S. Forest Service.

VHFHSZ: Very High Fire Hazard Severity Zones.

watershed: The land area drained by a particular stream course.

wildfire: Any fire occurring on undeveloped land; the term specifies a fire occurring on a wildland area that does not meet management objectives and thus requires a suppression response. Wildland fire protection agencies use this term generally to indicate a vegetation fire. Wildfire often replaces such terms as forest fire, brush fire, range fire, and grass fire.

wildland urban interface: The geographical meeting point of two disparate systems, wildland and structures. At this interface, structures and vegetation are close enough that a wildland fire could spread to structures or fire could spread from structures to ignite vegetation.

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